



Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC A+ Accredited

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Department of Civil Engineering

DEPARTMENT OF CIVIL ENGINEERING

Structure & Curriculum

From

Academic Year 2023-24

Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of Institute

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics , transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

To forge learning Center of Excellence in the field of Civil Engineering

Mission of the Department

- To promote academic and ethical development while upholding high standards.
- To provide advance facilities with the skills needed to face Industry and societal challenges.
- To promote socially responsible research, innovation, and entrepreneurship in the field of Civil Engineering.
- To foster the holistic development of both students and faculty members by inculcating a blend of knowledge and professional work methods for overall progress.

Program Education Objectives (PEO)

Graduates will be able to

- PEO1 : Analyse and design civil engineering structures while keeping social awareness and ethical responsibilities in mind.
- PEO2 : Demonstrate leadership abilities in supporting sustainable practices in Civil Engineering
- PEO3 : Exhibit a commitment to lifelong learning, staying updated on developing technologies and industry trends, and adjusting to the evolving world of Civil Engineering.
- PEO4 : Executing Proficiency in creative problem-solving and innovation, demonstrating an entrepreneurial attitude within the context of Civil Engineering.

Program Outcomes (PO)

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and

environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Third Year B. TECH in Civil Engineering

Semester – V

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	EXAM SCHEME				
									CT1	CT2	TA/CA	ESE	TOTAL
1	PCC	BCE3501	Reinforced Cement Concrete Structures	3	-	-	3	3	15	15	10	60	100
2	PCC	BCE3502	Advanced Structural Analysis	3	1	-	4	4	15	15	10	60	100
3	PCC	BCE3503	Advanced Surveying	3	-	-	3	3	15	15	10	60	100
4	PEC	BCE3504-07	Program Elective-I	3	-	-	3	3	15	15	10	60	100
5	PEC	BCE3508-11	Program Elective-II	3	-	-	3	3	15	15	10	60	100
6	OEC	BCEXX01-14	Open Elective-I	3	-	-	3	3	15	15	10	60	100
7	PCC	BCE3516	Reinforced Cement Concrete Structures Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BCE3517	Advanced Structural Analysis Lab	-	-	2	2	1	-	-	25	25	50
9	PCC	BCE3518	Advanced Surveying Lab	-	-	2	2	1	-	-	25	25	50
10	PROJ	BCE3519	Micro Project	-	-	2	2	1			25	25	50
11	MCC	BAU3505	Heritage	2	-	-	2	Audit	-	-	-	-	-
			Total	20	1	8	29	23	90	90	160	460	800

L- Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2

ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	--	--	-	13	06	03	01	Yes
Cumulative Sum	06	27	18	41	06	03	02	--

PROGRESSIVE TOTAL CREDITS :80+23 =103


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SCHEME OF INSTRUCTION & SYLLABI

Programme: Civil Engineering

Scheme of Instructions: Third Year B. TECH in Civil Engineering

Semester – VI

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	EXAM SCHEME				
									CT1	CT2	TA/CA	ESE	TOTAL
1	PCC	BCE3601	Advanced Fluid Mechanics	3	-	-	3	3	15	15	10	60	100
2	PCC	BCE3602	Design of Steel Structures	3	-	-	3	3	15	15	10	60	100
3	PCC	BCE3603	Geotechnical Engineering	3	-	-	3	3	15	15	10	60	100
4	PEC	BCE3604-07	Program Elective-III	3	-	-	3	3	15	15	10	60	100
5	PEC	BCE3608-11	Program Elective-IV	3	-	-	3	3	15	15	10	60	100
6	OEC	BCEXX01-14	Open Elective -II	3	-	-	3	3	15	15	10	60	100
7	PCC	BCE3616	Geotechnical Engineering Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BCE3617	Steel Structures Lab	-	-	2	2	1	-	-	25	25	50
9	PCC	BCE3618	Advanced Fluid Mechanics Lab	-	-	2	2	1	-	-	25	25	50
10	PROJ	BCE3619	Mini Project#	-	-	2	2	1+1#	-	-	25	25	50
11	MCC	BAU3606	Social Awareness	2	-	-	2	Audit	-	-	-	-	-
Total				20	-	8	28	23	90	90	160	460	800

Every Student will undergo Industrial Training/Internship of Two weeks in summer vacation after B. TECH VI Sem. Examinations, upon successful completion of industrial training/internship 01 credit will be awarded after submission of the report in prescribed format.

L- Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2

ESE- End Semester Examination (For Laboratory End Semester performance)

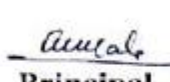
Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	--	--	--	12	06	03	02	Yes
Cumulative Sum	06	27	18	53	12	06	04	--

PROGRESSIVE TOTAL CREDITS: 103+ 23 = 126


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Program: Civil Engineering


List of Electives offered by Civil Engineering Department

Program Elective- I	Program Elective- II	Program Elective- III	Program Elective- IV
Semester V Environmental Engineering	Semester V Hydrology & Water Resources Engineering	Semester VI Hydraulics	Semester VI Construction Engineering & Management
BCE3504 -Rural Water Supply and Sanitation	BCE3508 -Water Resources Engineering	BCE3604 -Design of hydraulic structures	BCE3608 -Building Construction Practice
BCE3505 -Environmental Laws and Policy	BCE3509 -Water Quality Engineering	BCE3605 -Hydraulic modelling	BCE3609 - Advanced Building Construction Methods
BCE3506 -Solid and Hazardous Waste Management	BCE3510 -Surface Hydrology	BCE3606 -Urban Hydrology and Hydraulics	BCE3610 -Structural Audit & Retrofitting of Structures
BCE3507 -Air and Noise Pollution Control	BCE3511 -Flood Control & Drainage Engineering	BCE3607 -River Engineering	BCE3611 -Construction Equipment & Automation



Program Elective- V	Program Elective- VI	Program Elective- VII	Open Elective- I	Open Elective- II
Semester VII Transportation Engineering	Semester VII Structural Engineering	Semester VII Geotechnical Engineering	Semester V	Semester VI
BCE4703 -Pavement Design	BCE4707 -High Rise Structures	BCE4715 -Foundation Engineering	BCEXX07 - Introduction to art and Aesthetics	BCEXX08 -Metro Systems & Engineering
BCE4704 -Urban Transportation Planning	BCE4708 - Industrial Structures	BCE4716 -Geotechnical Design		
BCE4705 -Airport Planning and Design	BCE4709 -Prestressed Concrete	BCE4717 -Structural Geology		
BCE4706 -High Speed Rail Engineering	BCE4710 -Earthquake Engineering	BCE4718 -Rock Mechanics		


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Program: B.Tech. Civil Engineering				
Semester-V	BCE3501: Reinforced Cement Concrete Structures			
Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15Marks
Tutorial			CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre-Requisites: Structural Analysis			Total Marks	100 Marks
Course Contents				
Unit I	Introduction to the Working Stress Method of RCC design. Basic concept in design for flexure, assumptions, design constants. Analysis of the rectangular section. (Balanced, under–reinforced and over– reinforced sections). Introduction to Prestress Concrete: Properties of high grade materials, concepts of prestress concrete, method of pre-stressing, losses in pre-stressing. Various systems for pre-stressing with particular reference to Freyssinet, Magnel Blatton and Giffod Udall system			
Unit II	Introduction to Limit State Design: Concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse, other limit states. Review of IS – 456-2000.			
Unit III	Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Balanced failure mode, primary tension failure mode and primary compression failure mode, Analysis & Design of Doubly reinforced sections.			
Unit IV	Limit state of collapse in flexure: Analysis and design of Tee and L-beam section. Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves. Design of rectangular pad/ slopped footing for axial load.			
Unit V	Design of one-way, simply supported, single span and cantilever slabs, and continuous slab/ beam with IS coefficients. Design of RCC Two way slab with various end conditions using IS code coefficient. Deflection calculation for one-way slabs, Design of staircases			
Text Books				
T.1	“Limit State Design of Reinforced Concrete” author by P.C. Vergese,2 nd edition,Prentice Hall Publishers, 2008.			
T.2	“Advanced Reinforced Concrete Design” author by Varghese, P.C. 2 nd edition REPRINT Phi Learning Private Limited.			
T.3	“Reinforced Concrete Design” author by Pillai, S.Unnikrishn a, Menon, Devdas 3 rd edition REPRINMT Mc Graw Hill			
T.4	“Structural Design And Drawing : Reinforced Concrete And Steel” author by Raju N. Krishna 3 rd edition REPRINT Universities Press Pvt. Ltd			

Reference Books	
R.1	“Reinforced Concrete Structures (Vol-I)”, author by Punmia B.C., Ashok Kumar Jain., Arun Kumar Jain, 2 nd edition, Laxmi Publications Pvt Ltd, NewDelhi, 2007
R.2	“Design Of Reinforced Concrete Structures” author by Ramamrutham,S. & Narayan, R. 12 th edition REPRINT Dhanpatrai Publications (P) Ltd.
R.3	“Prestressed Concrete” author by N. Krishana Raju, 5 th edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2012
R.4	“Fundamentals Of Reinforced Concrete” author by Sinha, N.C., Roy, S.K., 3 rd edition REPRINT S. Chand publication
Useful Links	
1	https://nptel.ac.in/courses/105/105/105105104/

	Course Outcomes	CL	Class Sessions
BCE3501.1	Analyze reinforced concrete beam by working stress method and pre-stressed concrete.	4	9
BCE3501.2	Illustrate the concept of limit state design for RCC structure.	3	8
BCE3501.3	Design the singly reinforced rectangular sections and doubly reinforced rectangular sections	4	9
BCE3501.4	Design the flexural and compression members by limit state method.	4	9
BCE3501.5	Design and detailing of one way & two way slab and staircase.	5	10

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Program: B.Tech. Civil Engineering				
Semester-V		BCE3502: Advanced Structural Analysis		
Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15Marks
Tutorial	1 Hrs/week		CT-II	15 Marks
Total Credits	4		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre-Requisites: Engineering Mechanics, Structural Analysis			Total Marks	100 Marks
Course Contents				
Unit I	Beams curved in plan: Introduction, circular beam loaded with uniformly and supported on symmetrically placed column, simply supported semicircular beam supported on three supported equally spaced, quarter circle beam fixed at one end and free at other end carrying point load at free end. Beams curved in elevation: Introduction, assumptions, expression for flexural stresses in curved beam/ Winkler-Bach theory, different cross section for curved beam			
Unit II	Two hinged arches: basic concept, analysis of two hinged circular and parabolic arch subjected to uniformly distributed and point loads respectively considering supports at same level			
Unit III	Three hinged arches: basic concept, linear arch, bending moment: Eddy’s theorem, analysis of three hinged circular and parabolic arch subjected to uniformly distributed, Influence line diagram for axial thrust, shear and moment of three hinge arches			
Unit IV	Analysis of cables: Equation of the cable subjected to uniformly distributed load, Horizontal tension in the cable, Tension in the cable supported at different levels, Length of the cable, Effect of change in temperature			
Unit V	Introduction to structural dynamics, D'Alembert principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency, (MDOF (up to 3 DOF), mode shape and nodal frequency). Introduction to finite Element method, basic concepts, discretization of structures, Rayleigh Ritz method for Displacement based bar elements (Prismatic/Non-prismatic)			
Text Books				
T.1	“Analysis of Structure”, Vol II, V N Vazirani, M M Ratwani and S K Duggal, Sixteenth Edition, Khanna Publisher, Delhi			
T.2	Mechanics of Structures, Vol. I & II, S B Junnarkar and H J Shah, Twenty Fourth Editions, Charotar Publishing House, Pvt Ltd, Anand.			
T.3	“Basic structural Analysis”, author by C .S Reddy, 3rd Edition , Tata McGraw Hill Publication, New Delhi, 2010			
T.4	“Structural Analysis: A Unified Classical and Matrix Approach” author by Ghali A., Neville A., M. Brown, T.G, 7th edition REPRINT Taylor And Francis publications			
Reference Books				

R.1	“Strength of Materials”, Stephen Timoshenko, Third Edition, CBS Publisher & distributor, New Delhi
R.2	“Theory of Structures” Vol I, G S Pandit, S P Gupta and R Gupta, McGraw Hill Education (India) Pvt Ltd, New Delhi
R.3	“Mechanics of Materials”, E P Popov, Pearson
R.4	“Fundamentals of Structural Analysis”, Kenneth M Leet, Chia-Ming Uang and Anne M Gilbert, Third edition, McGraw Hill Education (India) Pvt Ltd, New Delhi
Useful Links	
1	https://nptel.ac.in/courses/105/106/105106050/

	Course Outcomes	CL	Class Sessions
BCE3502.1	Analyze beam curved in plan and elevation.	4	9
BCE3502.2	Analyze two hinged arches for axial thrust, shear and moment	4	9
BCE3502.3	Analyze three hinged arches for axial thrust, shear and moment	4	9
BCE3502.4	Analyze the stresses & tensions in cables	4	9
BCE3502.5	Evaluate prismatic / non-prismatic displacement-based bar element using finite Element method and Rayleigh Ritz method	5	9

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Program: B.Tech. Civil Engineering				
Semester-V	BCE3503: Advanced Surveying			
Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15Marks
Tutorial			CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre-Requisites: Engineering Mechanics, Surveying			Total Marks	100 Marks
Course Contents				
Unit I	Tacheometric Surveying: Classification, principal of stadia method, theory of Anallatic lens, distance and elevation formulae, tangential method, errors in stadia surveying.			
Unit II	Curves: Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve -Vertical curves.			
Unit III	Geodetic Surveying and Triangulation Adjustment Geodetic Surveying: Classification of triangulation survey, inter-visibility of stations, fieldwork, reduction to centre, base line measurement, corrections. Triangulation Adjustment: Definitions, weighted observations, laws of weights, station adjustment, figure adjustment (Triangle only)			
Unit IV	Advanced Techniques in Surveying: Total station, Electromagnetic Distance Measurement (EDM) Remote Sensing: Introduction, definitions, Remote sensing systems, advantages, Basic Principles, energy interaction in the atmosphere, Indian remote sensing Satellite series and their characteristics GIS & GPS: Components of geographical information system (GIS) - advantages, function of GIS, Raster and vector data, advantages and disadvantages, Global Positioning System (GPS) - Introduction, definitions, GPS receivers, antenna, advantages of GPS.			
Unit V	Photographic Surveying: Basic definitions, terrestrial and aerial photography, scale of Aerial photo relief, Tilt and height displacements, heights from relief displacement and parallax measurements, flight planning, study of photo theodolite and stereoscope. Hydrographic Surveying, Underground Surveying.			
Text Books				
T.1	Surveying & Levelling – Dr. B.C. Punmia (Vol 2) Laxmi Publications, 16 th edition 2016			
T.2	Surveying & Levelling – Kanetkar & Kulkarni (Vol 2) Pune Vidyarthi Griha Prakashan, 2008 edition			
T.3	Surveying-III Higher Surveying – Dr. B.C. Punmia (Vol 3) Laxmi Publications, 15 th edition 2016			
T.4	Surveying (Vol 2) – S. K. Duggal, McGraw-Hill, 5 th edition 2019			
T.5	Advanced Surveying – G.B. Deshpande, M.V. Jadhav, Nirali Prakashan, 4 th reprint edition			

Reference Books	
R.1	Remote sensing & G.I.S. – Dr. M. Anji Reddy, BS Publications, 4 th edition 2012
R.2	Surveying and Leveling – N. N. Basak, Tata McGraw–Hill Education, 2 nd edition 2017
R.3	Remote sensing & G.I.S. – Basudeb Bhatta, Oxford Higher Education, 2 nd edition 2011
R.4	GPS for Land Surveyors – Jan Van Sickle, CRC Press, 4 th edition 2015
Useful Links	
1	https://nptel.ac.in/courses/105/107/105107122/

	Course Outcomes	CL	Class Sessions
BCE3503.1	Illustrate the concepts of basic surveying techniques	3	8
BCE3503.2	Integrating the knowledge of curves in practical surveying tasks.	3	8
BCE3503.3	Classify geodetic & triangulation surveys and conduct field work using surveying instruments	4	9
BCE3503.4	Apply the concepts of modern surveying techniques & instrumentation	3	11
BCE3503.5	Construct mini project using surveying techniques and concept of Photographic & Hydrographic Surveying.	4	9

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Program: B.Tech. Civil Engineering				
Semester-V	BCE3504: Rural Water Supply & Sanitation (PE-I)			
Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15Marks
Tutorial			CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre-Requisites: Environmental Engineering			Total Marks	100 Marks
Course Contents				
Unit I	Concept of environment and scope of sanitation in rural areas. Magnitude of problem of water supply and sanitation – population to be covered and difficulties. National policy. Introduction to Jal Jeevan Mission and its implication in rural India			
Unit II	Various approaches for planning of water supply systems in rural areas. Selection and Development of preferred sources of water, springs, wells, infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source.			
Unit III	Specific problems in rural water supply and treatment iron, manganese, fluorides etc., Low-cost treatment, appropriate technology for water supply and sanitation. Improvised methods and compact system of treatment of surface and ground waters such as MB settlers, slow sand filter, chlorine diffusion cartridges etc.			
Unit IV	Water supply through spot sources, hand pumps, open dug-wells, Planning of distribution system in rural areas, Water supply during fairs, festivals and emergencies.			
Unit V	Treatment and disposal of wastewater/sewage, various methods of collection and disposal of night soil. Sanitation system and community latrines. Simple wastewater treatment system for rural areas and small communities such as stabilization ponds, septic tanks, and soakage pits etc., Composting, land filling, and Biogas plants.			
Text Books				
T.1	Rural Water Supply and Sanitation – Sanjay Gupta, Vayu Education of India, 1 st edition 2012			
T.2	Rural Development (Principles, Policies and Management) – Katar Singh, SAGE Publications India Pvt. Ltd, 4 th edition 2016			
T.3	Rural Development in India (Strategies & Processes) – G. Sreedhar & D. Rajasekhar, Publisher, 1 st edition 2014			
T.4	Rural Development in India – K.R. Gupta, Atlantic Publication, 2010 edition			
Reference Books				
R.1	Rural Water Supply & Sanitation – Krieger Publishing Company, 3 rd edition 1977			
R.2	Low cost On-site sanitation option, Hoffman & Occasional Nov. 1981 Paper No. 21. P.O. Box 5500 2280 HM Rijswijk, The Netherlands offices JC Monkeriaan 5 Rijswijk (The Hague)			
R.3	Manual of Water supply and Treatment, CPHEEO, GOI, New Delhi, 2009			

R.4	Water supply for Rural areas and small communities, EG Wagner and N Lanoik, Geneva, W.H.O. 1959
Useful Links	
1	https://nptel.ac.in/courses/105/105/105105201/
2	https://nptel.ac.in/courses/105/101/105101010/

	Course Outcomes	CL	Class Sessions
BCE3504.1	Illustrate concept & magnitude of problem of rural water supply & sanitation	3	8
BCE3504.2	Evaluate the approaches for planning of water supply systems in rural areas	5	9
BCE3504.3	Analyze improvised methods & compact system of treatment of surface and ground waters	4	9
BCE3504.4	Illustrate planning of distribution system in rural areas on special occasions & emergencies	3	9
BCE3504.5	Analyze sanitation & simple wastewater treatment system for rural areas and small communities	4	10

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Program: B.Tech. Civil Engineering					
Semester-V		BCE3505: Environmental Laws & Policy (PE-I)			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15Marks
Tutorial				CT-II	15 Marks
Total Credits	3			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites: Environmental Engineering				Total Marks	100 Marks
Course Contents					
Unit I	Environment Definitions and Acts: Environment definition in Indian law - Different environmental protection legislations-History of Environmental protection in India - Provisions in Indian Penal Code for Environmental protection-The constitutions of India – Union list- State list – Concurrent list - Panchayats and Municipalities role				
Unit II	Water (prevention & control of Pollution) Act & Air (prevention & control of Pollution) Act: Water pollution – definition – Water (Conservation and protection) Act 1974 – Objectives of Water Act – Legislation to control water pollution – Functions of CPCB and SPCB - Local bodies role – Water (prevention & control of pollution) Act 1974 as amended by Amendment Act 1988. Water (prevention and control of pollution) Rules 1975 - Water (prevention & control of Pollution) Cess Act 1977 as amended by Amendment Act 1987 and relevant notifications - Tolerance limits for effluents discharge and drinking water - Constitution and Resources management and pollution control – Air (prevention & control of Pollution) Act 1981-Sections of Air (prevention & control of Pollution) Act 19, 20, 21, 22-Penalties - Ambient air quality standards-Noise and the Laws				
Unit III	Environmental (Protection) Act 1986: Environment and pollution - definition as per Environmental law-General powers of Central and state Government under EPA-Important Notification in EPA 1986- The Indian Forest Act 1927- Forest Conservation Act 1980 - Wild Life (Protection) Act - Constitution of Pollution Control Boards - Powers, functions, Accounts, Audit etc. – Equitable remedies for pollution control				
Unit IV	Municipal Solid Waste Management Rules: Solid waste management – Hazardous Wastes (Handling and Management) Rules 1998-Bio-medical Wastes (Handling and Management) Rules 1998-Recyclled plastics (Manufacture and Usage) Rules, 1999-Municipal Solid Waste Management Act 2003- Rules - E.I.A and Public Hearing- Ecolabeling-Eco Mark				
Unit V	Coastal Regulation Zone Notification and Green Benches: Coastal Regulation Zone - definition-Importance of coral reef-Regulation activities in CRZ - The Biological Diversity Act 2002-Bio diversity Rules 2004 - The Intellectual Property Rights (IPR)-National Environment Appellate Authority – Environmental Tribunal and Green Benches - Some Important cases on Environment - International Conventions - Protocols for protection of the Environment				

Text Books	
T.1	Environmental Policies in India - Surendra Kumar, Northan Book Centre, New Delhi, 2009 edition
T.2	Environmental law and policy in India – Shyam Divan and Armin Roseneranz, Oxford University Press, New Delhi, 2001 edition
T.3	Textbook of Environmental Law – Dr. N. Maheshwara Swamy, Asia Law House, 2 nd edition 2013
T.4	Environmental Science and Engineering – Suresh K. Dhameja, S.K. Katania & Sons, Reprint 2013 edition
Reference Books	
R.1	The Impact of Environment Laws on Industry – Surendra Kumar, Aditya Books, 2006 edition
R.2	Environmental Pollution and Control – Dr. H.S. Bhatia – Galgotia Publication, 2 nd edition 2018
R.3	Environmental Law – Dr. H. N. Tiwari, Allahabad Law Agency, 2016 edition
R.4	CPCB, “Pollution Control acts, Rules and Notifications issued there under “Pollution Control Series – PCL/2/1992, Central Pollution Control Board, Delhi, 1997
Useful Links	
1	https://nptel.ac.in/courses/105/107/105107181/

	Course Outcomes	CL	Class Sessions
BCE3505.1	Use basic knowledge of environment, pollution, legislations & Acts	3	8
BCE3505.2	Relate & learn about the legal provisions of water pollution & air pollution	3	10
BCE3505.3	Apply the knowledge of Constitutional provisions for the Protection of environment & forests	3	9
BCE3505.4	Interpret the knowledge of Municipal solid waste & Hazardous waste management Acts	3	8
BCE3505.5	Distinguish international conventions & protocols for environment protection	4	10

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Program: B.Tech. Civil Engineering					
Semester-V		BCE3506: Solid and Hazardous Waste Management (PE-I)			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15Marks
Tutorial				CT-II	15 Marks
Total Credits	3			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites: Environmental Engineering				Total Marks	100 Marks
Course Contents					
Unit I	Introduction to solid waste management (SWM): Structure, necessity and responsibility, Sources, Quantity and quality, Sources of solid waste, classification and components, physical and chemical characteristics, per capita contribution, sampling and analysis.				
Unit II	Collection and transportation of solid waste: Method of collection, equipment used for collection and transportation, transfer stations, optimization of transport route. Solid waste processing: Methods of processing, choice of methods, merits and demerits of various methods, gas control measures. The 3R's concept.				
Unit III	Composting of waste, methods of composting, factors affecting composting Sanitary land filling: Site requirements, methods, leachate management, control of gases. Incineration: Principles of incineration, types of incinerators, advantages and disadvantages, 3T Diagrams				
Unit IV	Need for hazardous waste management – Sources of hazardous wastes – Effects on community – terminology and classification – Storage and collection of hazardous wastes – Problems in developing countries – Protection of public health and the environment.				
Unit V	Management of Hazardous Waste: Identifying a hazardous waste – methods – Quantities of hazardous waste generated – Components of a hazardous waste management plan – Hazardous waste minimization – Disposal practices in Indian industries – Future challenges.				
Text Books					
T.1	Solid and Hazardous Waste Management – M. N. Rao, Butterworth-Heinemann Publication, 1 st edition 2016				
T.2	Solid and Hazardous Waste Management – P. M. Cherry, CBS Publishers, 2017 edition				
T.3	Solid Waste Management – K. Sasikumar, PHI Learning, 2013 edition				
T.4	Textbook of Solid Wastes Management – Iqbal H Khan, CBS Publishers, 1 st edition 2017				
Reference Books					
R.1	Solid Waste Management in Developing Countries – A.D. Bhide, B.B. Sundaresan (NEERI, India) Indian National Scientific Documentation Centre, January 1, 1983				
R.2	Integrated Solid Waste Management – George Tchobanoglous, McGraw-Hill, New York, 1993 edition				
R.3	CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000				

R.4	Standard Handbook of Hazardous Waste Treatment and Disposal – Freeman H.M., 1989
Useful Links	
1	https://nptel.ac.in/courses/105/106/105106056/
2	https://nptel.ac.in/courses/105/103/105103205/

	Course Outcomes	CL	Class Sessions
BCE3506.1	Evaluate sampling and characterization of solid waste	5	9
BCE3506.2	Apply steps in solid waste management-waste reduction at source, collection techniques, materials and resource recovery/recycling	3	9
BCE3506.3	Relate engineering, financial and technical options for solid waste management	3	10
BCE3506.4	Relate aware of environment and health impacts of hazardous waste mismanagement	3	8
BCE3506.5	Analyze hazardous waste constituents including QA/QC issues	4	9

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Program: B.Tech. Civil Engineering					
Semester-V		BCE3507: Air and Noise Pollution Control (PE-I)			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15Marks
Tutorial				CT-II	15 Marks
Total Credits	3			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites: Environmental Engineering				Total Marks	100 Marks
Course Contents					
Unit I	Introduction to AIR POLLUTION: Definition, air pollution episodes, atmosphere & its zones. Classification and sources of air pollutants, Standards for air pollution (as per Indian Standards and CPHEEO). Effects of air pollutants on humans, animals, plants and materials.				
Unit II	Meteorological parameters and Air sampling: Primary and secondary parameters, atmospheric stability, plume behavior. Wind rose diagram, wind data analysis & wind impact area diagram, Stack height determination.				
Unit III	Air sampling and measurement: ambient air sampling and stack sampling, collection of particulate and gaseous pollutants, site selection criteria methods of estimation. Automobile exhaust: Introduction to Pollution due to diesel & petrol engines				
Unit IV	Air pollution controls methods and equipment; Principles of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters, cyclones and wet scrubbers, (adsorption, absorption, incineration, condensation)				
Unit V	NOISE POLLUTION: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.				
Text Books					
T.1	Air Pollution – M. N. Rao, McGraw Hill Education, 1 st edition 2017				
T.2	Environmental Pollution Control Engineering – C. S. Rao, New Age International Publishers, 3 rd edition 2018				
T.3	Sewage Disposal & Air Pollution Engineering – S. K. Garg, Khanna Publishers, 2016 edition				
T.4	Air Pollution – Pallavi Saxena & Vaishali Naik, CABI Publishing, 2018 edition				
Reference Books					
R.1	Air: Pollution, Climate change & India’s choice between Policy & Pretence – Dean Spears, Harper Collins India Publication, 2019 edition				

R.2	Clearing the Air – Tim Smedley, Bloomsbury Sigma Publication, 2019 edition
R.3	Fundamentals of Air Pollution – Daniel A. Vallero, Academic Press, 5 th edition 2014
R.4	Air pollution Control Theory - Martin Crawford, McGraw-Hill Inc. US, 1976 edition
Useful Links	
1	https://nptel.ac.in/courses/105/102/105102089/
2	https://nptel.ac.in/courses/105/102/105102175/

	Course Outcomes	CL	Class Sessions
BCE3507.1	Analyze history of air pollution, air pollution episodes, sources and classification of air pollutants	4	8
BCE3507.2	Classify fundamentals of air pollution and its associated environmental impacts	3	9
BCE3507.3	Relate techniques and instrumentation of ambient air sampling & monitoring	3	8
BCE3507.4	Evaluate the key concepts of air quality management & control	5	9
BCE3507.5	Analyze the concepts of noise pollution & its monitoring procedures	4	12

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Program: B.Tech. Civil Engineering				
Semester-V	BCE3508: Water Resources Engineering (PE-II)			
Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15Marks
Tutorial			CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3Hrs			ESE	60 Marks
Pre-Requisites: Hydrology and Water Resources			Total Marks	100 Marks
Course Contents				
Unit I	Introduction to Water Resources Field Methods. Types of water resources available, Scientific principles of measurement technologies and protocols used for water-resources measurements.			
Unit II	Experimental design of field-scale water-resources and environmental studies of water resources.			
Unit III	Water resources Planning, field studies; instruments and protocols for surface-water, groundwater.			
Unit IV	Water Quantity Management: Surface Water Storage Requirements, Storage Capacity and Yield, Reservoir Design, Water Allocations for Water Supply, Irrigation, Hydropower and Flood Control, Reservoir Operations, Groundwater management			
Unit V	Legal Aspects of Water & Environment Systems: Principles of Law applied to Water Rights and Water Allocation, Water Laws, Environmental Protection Law, Environmental Constraints on water Resources Development			
Text Books				
T.1	“Managing Water Resources Methods and Tools for a Systems Approach” authored By Slobodan P. Simonovic, 2009.			
T.2	“Hydrology” authored by Raghunath H.M., New Age International Publishers, 1985.			
T.3	“Elements of Water Resources Engineering” authored by Duggal K N &Soni J P, New Age International Publisher,1996.			
T.4	“Irrigation and Water Resources Engineering” authored by G L Asawa, New Age International Publisher, 2005.			
Reference Books				
R.1	“Water Resource Systems Planning and Management: An Introduction to Methods, Models, and Applications” authored by Daniel P. Loucks, Eelco van Beek, Deltares and UNESCO-IHE,2005.			
R.2	“Groundwater hydrology” authored by David Reith Tod, John Wiley publisher, 2002.			
R.3	“Water Resources Engineering” authored by Linsley R. K. and Franzini J. B., McGraw Hill Book Co., NY-1964.			
R.4	“Water Resources Engineering” authored by Ralph A. Wurbs, Wesley P Jamer, Prentice Hall 2002.			

Useful Links	
1	https://nptel.ac.in/courses/105/105/105105110/
2	https://nptel.ac.in/courses/105/104/105104030/

	Course Outcomes	CL	Class Sessions
BCE3508.1	Illustrate the types of techniques related to water resources field methods.	3	8
BCE3508.2	Analyze field scale water resources considering environmental impact.	4	9
BCE3508.3	Use the instruments and protocols for water resources.	3	8
BCE3508.4	Apply the knowledge of quantity management surface and sub-surface water	3	10
BCE3508.5	Use legal aspects of water and environment systems in water resource management	3	10

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Program: B.Tech. Civil Engineering					
Semester-V		BCE3509: Water Quality Engineering (PE-II)			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15Marks
Tutorial				CT-II	15 Marks
Total Credits	3			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites: Environmental Engineering				Total Marks	100 Marks
Course Contents					
Unit I	Holistic approach to Wastewater management, Water-quality sampling, Effluent & Stream standards, wastewater characteristics and their significance, disposal methods for wastewater on land and in water and its impact, self-purification of streams				
Unit II	Preliminary and primary treatment processes and units: Screens, grit chamber and primary settling tank- Principles, types & designs.				
Unit III	Secondary treatment processes & units: Concepts in biological treatment, bacterial growth, Activated sludge process, Trickling filter- Principles, types. Simple design problems / exercise.				
Unit IV	Other biological treatment units: Aerated lagoons, Stabilization Ponds, Up flow Sludge Blanket Reactors, Sludge Digester. Need of advanced treatment, removal of trace organics, micro screening and control of nutrients, nitrification and de- nitrification, removal of phosphorus.				
Unit V	Treatment alternatives for Industrial waste, volume reduction, strength reduction, equalization tank, neutralization tank, Specific industrial wastewater treatment for paper and pulp industry, sugar industry, distillery industry, dairy industry, textile industry.				
Text Books					
T.1	“Wastewater engineering” authored by B.C. Punmia, Laxmi Publications (P) Ltd., New Delhi, 2010.				
T.2	“Environmental Engineering (Volume-2)” authored by S. K. Garg, Khanna Publication,2010.				
T.3	“Water quality and treatment” authored by James KEdzwald, American Water works Association,2010.				
T.4	“Water Supply Engineering” authored by Dr P.N. Modi, Standard book house,1960.				
Reference Books					
R.1	“Wastewater Treatment Disposal and reuse” authored by Metcalf and Eddy, Tata McGraw Hill publishing company Ltd., 2006.				
R.2	“Water Quality Engineering Physical/Chemical treatment” authored by Mark Benjamin & Desmond Lawler Wiley Publication, 2013.				
R.3	“Water Quality Engineering in natural systems” authored by David A. Chin, Wiley Publication,2006.				

R.4	“Water Quality Engineering & Wastewater treatment by Yung Tse Hung, Hamidi Aziz, Issam A. Al-Khatib, etc, MDPI,2021.
Useful Links	
1	https://nptel.ac.in/courses/105/104/105104029/
2	https://nptel.ac.in/courses/105/107/105107129/

	Course Outcomes	CL	Class Sessions
BCE3509.1	Use the knowledge of disposal methods for waste water on land and in water.	3	9
BCE3509.2	Illustrate necessity, objectives layout of a wastewater treatment plant.	3	8
BCE3509.3	Apply the concept of advanced treatment processes for waste water.	3	9
BCE3509.4	Examine the biological characteristics and treatment of waste water.	4	10
BCE3509.5	Analyze types of treatment units for industrial waste water	4	9

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Program: B.Tech. Civil Engineering					
Semester-V		BCE3510: Surface Hydrology (PE-II)			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15 Marks
Tutorial				CT-II	15 Marks
Total Credits	3			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites: Hydrology and Water Resources Engineering				Total Marks	100 Marks
Course Contents					
Unit I	Introduction: Scope and importance of hydrology, Global and India’s Water resources, Applications of hydrology, Climate and Weather seasons in India. Watershed concept and modeling: Catchment-topographic and ground water divide, Description of the catchment, catchment processes, demarking a catchment, stream patterns, water budgeting. Classification of models, model formulation, Lumped parameter conceptual models, Physically based models, Model performance testing.				
Unit II	Evapo-transpiration-AET & PET, Reference Crop Evapo-transpiration by Blaney Criddle formula, Infiltration-Probability and Statistics-Introduction, Probability and Random variables, PDF and CDF, Distribution functions, Selection of distribution function and its parameter estimation.				
Unit III	Planning for water power development – estimation of available water power, power duration curve – storage and pondage – load studies – load duration curve – variations in load factor – power system load – system integrated operational studies – load prediction – market requirements of power – installed capacity – Benefits evaluation of installed capacity.				
Unit IV	Classification of hydropower development – storage power development – runoff river power development – pumped storage power development – small hydro power development. Hydro power plants – power plant structure – layout of hydropower plants – types of power houses – sizing of power house.				
Unit V	Water conductor system – intakes – location and types of intakes – penstock and pressure shafts – water hammer – water hammer equation – types of surge tanks.				
Text Books					
T.1	“Engineering Hydrology” authored by Ojha, C.S.P., Berndtsson, R., and Bhunya, P, Oxford University Press, 2008				
T.2	“Hydrology” authored by Raghunath H.M., New Age International Publishers, 1985.				
T.3	“Surface Water Hydrology” authored by V. P. Singh, M. Al-Rashed and M. M. Sherif, CRC Press, 2002				
T.4	“Engineering Hydrology” authored by K Subramanya , M c Graw Hills,1984.				

Reference Books	
R.1	“Applied Hydrology” authored by Ven Te Chow, David, Larry, Mac Graw Hill Publications,1988.
R.2	“Groundwater Hydrology “authored by David Keith Todd, Wiley publication,2005.
R.3	“Applied Surface Hydrology” authored by O. Starosolszky, Water Resources Publication,1987.
R.4	“Engineering Hydrology” authored by Saeid Eslamian, Taylor and Francis Group,2014.
Useful Links	
1	https://nptel.ac.in/courses/105/104/105104029/
2	https://nptel.ac.in/courses/105/107/105107129/

	Course Outcomes	CL	Class Sessions
BCE3510.1	Apply hydrology principles to solve water resources management problems.	3	10
BCE3510.2	Evaluate evapo-transpiration & infiltration rate values.	5	10
BCE3510.3	Evaluate water power development criteria & characteristics.	5	9
BCE3510.4	Plan Hydro power plant structure & layout.	5	8
BCE3510.5	Analyze water conductor system & water hammer	4	8

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Program: B.Tech. Civil Engineering					
Semester-V		BCE3511: Flood Control & Drainage Engineering (PE-II)			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15 Marks
Tutorial				CT-II	15 Marks
Total Credits	3			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites: Hydrology				Total Marks	100 Marks
Course Contents					
Unit I	Flood Engineering: General: Introduction, Basics of floods, Natural and man-made floods, flows in catchments, Causes of flooding, Environmental and economic losses, Flood control structures. Flood Hazard Mitigation: Flood management measures, Flood control strategies.				
Unit II	Estimation of Design Flood: Introduction, Methods of design flood computations: Observation of Highest Flood, Empirical flood formulae, Flood frequency studies - Gumbel's method-Design flood and design storm. Flood routing through reservoirs - general, basic principles of flood routing ISD method- Modified Pulse method.				
Unit III	Risk Management: Risk assessment, Risk reduction and management, Advanced Warning Systems: Global positioning systems, Applications of remote sensing and GIS, Role of Information Technology in natural hazard mitigation management				
Unit IV	Drainage Engineering: Land Drainage systems: necessity-types-surface and subsurface drainage-design considerations. Introduction to Drainage Problems in Different Climates: Urbanization - Its effects and consequences for drainage. Operation and Maintenance of Urban Drainage Systems: Maintenance requirements and planning, Cleansing of sewers and drains, repair options.				
Unit V	Patterns of drainage system: Drainage criteria formulation for off season drainage, crop season drainage, salt drainage - use of steady state and unsteady state approaches in formulation. - criteria for irrigated area. – incorporation of intentional and unavoidable losses.				
Text Books					
T.1	“A text book of Hydrology”, Dr. P. Jayarami Reddy, Laxmi publications (2005)				
T.2	“Applied Hydrology”, Linsley R.K, Kohler.M.A & Palhus.J.L, Mc Graw Hill (2017)				
T.3	“Land Drainage Principles: Methods and Applications”, Bhattacharya A K and Michael A M, Konark Publishers Pvt. Ltd., New Delhi, 2003				
T.4	"Hydrology", H M Reghunath, New Age International (P) Limited, Publishers (1987)				

Reference Books	
R.1	“Floods: Hydrological, Sedimentological and Geomorphological Implications”, Beven, K. and Carling, P., British Geomorphological Research Group Symposia Series, Wiley, Chichester, 1989
R.2	“Hazard Mitigation and Preparedness”, A.K. Schwab, K. Eschelbach, David J. Brower, John Wiley, 2007
R.3	“Economic Effects of Floods”, Brown, J.P, Springer-Verlag, Berlin, 1972
R.4	“Wrath of Nature: Impact of Environmental Destruction on Floods and Droughts”, Centre for Science & Environment, New Delhi
Useful Links	
1	https://nptel.ac.in/courses/105103193

	Course Outcomes	CL	Class Sessions
BCE3511.1	Relate the role and responsibility of engineers in Flood Mitigation.	3	8
BCE3511.2	Relate the role and responsibility of engineers in Estimation of Design Flood	3	10
BCE3511.3	Apply the knowledge of GPS, GIS, Remote Sensing in Natural Hazard Mitigation	3	8
BCE3511.4	Apply the Concept in Operation and Maintenance of Urban Drainage System.	3	10
BCE3511.5	Examine pattern of Drainage system at Irrigation area.	4	9


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Program: B.Tech. Civil Engineering					
Semester-V		BCE3516: Reinforced Cement Concrete Structures Lab			
Teaching Scheme				Examination Scheme	
Practical	2 Hrs/week			CT-I	--
				CT-II	--
Total Credits	1			CA	25 Marks
				ESE	25 Marks
Pre-Requisites: Reinforced Cement Concrete				Total Marks	50 Marks
Course Contents					CO
1	Design of Singly Reinforced beams as per relevant IS Code				CO 2
2	Design of Doubly Reinforced beams as per relevant IS Code				CO 2
3	Design of one way slab				CO 4
4	Design of two way slab				CO 4
5	Design of columns subjected to axial load.				CO 3
6	Design of isolated footing for column subjected to axial loads				CO 3
7	Design of staircases				CO 4
8	Understanding the professional RCC drawing				CO 1
9	Minimum One Site visit pertaining to Prestressed Concrete Industry				CO1, CO2, CO3, CO4,
Text Books					
T.1	“Limit State Design of Reinforced Concrete” author by P.C. Vergese, 2 nd edition, Prentice Hall Publishers, 2008.				
T.2	“Advanced Reinforced Concrete Design” author by Varghese, P.C. 2 nd edition REPRINT Phi Learning Private Limited.				
T.3	“Reinforced Concrete Design” author by Pillai, S. Unnikrishna, Menon, Devdas 3 rd edition REPRINT Mc Graw Hill				
T.4	“Structural Design And Drawing : Reinforced Concrete And Steel” author by Raju N. Krishna 3 rd edition REPRINT Universities Press Pvt. Ltd				
Reference Books					
R.1	“Reinforced Concrete Structures (Vol-I)”, author by Punmia B.C., Ashok Kumar Jain., Arun Kumar Jain, 2 nd edition, Laxmi Publications Pvt Ltd, New Delhi, 2007				
R.2	“Design Of Reinforced Concrete Structures” author by Ramamrutham, S. & Narayan, R. 12 th edition REPRINT Hanpatrai Publications (P) Ltd.				
R.3	“Prestressed Concrete” author by N. Krishana Raju, 5 th edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2012				
R.4	“Fundamentals Of Reinforced Concrete” author by Sinha, N.C., Roy, S.K., 3 rd edition REPRINT S. Chand publication				
Useful Links					

1	https://nptel.ac.in/courses/105/105/105105104/
2	https://nptel.ac.in/courses/105/105/105105105/

	Course Outcomes	CL	Lab Sessions
BCE3516.1	Illustrate the concept of Limit State Design for structures	3	4
BCE3516.2	Analyze the singly reinforced rectangular sections, doubly reinforced rectangular sections	4	6
BCE3516.3	Analyze flexural and compression members by Limit State Design	4	6
BCE3516.4	Evaluate the design and detailing of RCC structural elements required for buildings and design of one-way and two-way slab.	5	8

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Program: B.Tech. Civil Engineering					
Semester-V		BCE3517: Advanced Structural Analysis Lab			
Teaching Scheme				Examination Scheme	
Practical	2 Hrs/week			CT-I	--
				CT-II	--
Total Credits	1			CA	25 Marks
				ESE	25 Marks
Pre-Requisites: Structural Analysis				Total Marks	50 Marks
Course Contents					CO
1	Minimum two numerical to find bending stress for beam curved in elevation				CO 1
2	Minimum two numerical to find maximum shear force and bending moment for the beam curved in plan.				CO 1
3	Minimum two numerical to analyze two hinged circular and parabolic arch.				CO 2
4	Minimum two numerical to analyze three hinged circular and parabolic arch.				CO 3
5	Minimum two numerical to analyze Cables.				CO 4
6	Minimum two numerical on Rayleigh Ritz method for Prismatic/Non-prismatic displacement-based Bar elements				CO 5
7	Minimum two numerical on Finite Element method for Prismatic/Non-prismatic displacement-based Bar elements				CO 5
8	Analysis of Design a Multistoried Building (G+2) using software package				CO 1, CO 2, CO 3, CO 4
9	Analyze a multi storied frame structure subjected to vertical forces using software package. Compare the software result of analysis with manual analysis result.				
10	Site visit: Compulsory site visit for understanding curved beams/Arches/Cables				
Text Books					
T.1	“Structural Analysis (Matrix Approach)”, author by Pandit G.S and Gupta S.P, 2 nd edition, Tata McGraw Hill education Publishing company LTD, New Delhi, 2008.				
T.2	“Basic structural Analysis”, author by C.S Reddy, 3 rd Edition , Tata McGraw Hill Publication, New Delhi, 2010.				
T.3	“Structural Analysis : A Matrix Approach” author by Pandit G. S., and Gupta S. P., 2 nd edition, McGraw Hill publication				
T.4	“Structural Analysis” author by Ghali A., Neville A., M. Brown, T.G , 6 th edition REPRINT Taylor And Francis publications				
Reference Books					
R.1	“Structural,Design-II” author by Choudhary S. S., Parekar, S.R. 1 st edition REPRINT Nirali Prakashan publication				
R.2	“Basic Structural Analysis” author by Reddy C.S., 3 rd edition, McGraw Hill publication.				

R.3	“Structural Design-I” author by Parekar S.R. and Choudhary, 2 nd edition REPRINT Nirali Prakashan publication
R.4	“Structural Analysis-Matrix Approach” author by G.S. Pandit& S.P. Gupta, Tata, 2 nd edition, McGraw Hill Publishing, 2008
Useful Links	
1	https://nptel.ac.in/courses/105/106/105106050/

	Course Outcomes	CL	Lab Sessions
BCE3517.1	Analyze beam curved in plan and elevation.	4	9
BCE3517.2	Analyze two hinged arches for axial thrust, shear and moment	4	9
BCE3517.3	Analyze three hinged arches for axial thrust, shear and moment	4	9
BCE3517.4	Analyze the stresses & tensions in cables	4	9
BCE3517.5	Evaluate prismatic / Non-prismatic displacement based bar element using finite Element method and Rayleigh Ritz method	5	9

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Tulsiramji Gaikwad-Patil
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		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade) (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)			
Program: B.Tech. Civil Engineering					
Semester-V		BCE3518: Advanced Surveying Lab			
Teaching Scheme				Examination Scheme	
Practical	2 Hrs/week			CT-I	--
				CT-II	--
Total Credits	1			CA	25 Marks
				ESE	25 Marks
Pre-Requisites: Surveying				Total Marks	50 Marks
Course Contents					CO
1	Determination of constants of Tacheometer				CO1
2	Determination of elevation of points by Tacheometric surveying				CO1
3	Determination of elevation of points and horizontal distance between them by Tacheometric survey				CO1
4	Determination of gradient of given length of road by Tacheometric survey				CO1
5	Setting out of simple circular curve by offsets from chord produced method				CO2
6	Setting out of simple circular curve by Rankine method of tangential angle				CO2
7	Setting out of simple transition curve by tangential angle method				CO2
8	Use of Advanced techniques of surveying – Study of Stereoscope				CO4
9	Toposheet: Understanding and identification of different features of drawing				CO4
10	Study of Total station and Use of Total Station to measure horizontal distance				CO3
11	Use of Total Station to measure angles and elevations.				CO3
12	Use total Station to carry out survey Project for closed traverse				CO3
13	Survey project should be carried out for minimum 2 days in the following areas: (a) Road Project (b) Irrigation Project (c) Water Supply Project				CO5
Text Books					
T.1	Surveying and Levelling - Kanetkar and Kulkarni (Vol.II), Pune Vidyarthi Griha Prakashan				
T.2	Surveying and Levelling - Dr. B.C. Punmia (Vol. II & III), Laxmi Publications				
Reference Books					
R.1	Remote sensing & G.I.S. by Dr. M. Anji Reddy				



Useful Links

1 <https://nptel.ac.in/courses/105/107/105107122/>

	Course Outcomes	CL	Lab Sessions
BCE3518.1	Use the techniques of Tacheometric surveying	3	4
BCE3518.2	Illustrate the methods of setting of simple circular curve.	4	4
BCE3518.3	Apply the concepts of modern surveying techniques & instrumentation	3	10
BCE3518.4	Operate survey instruments effectively with precision	4	6
BCE3518.5	Design mini project using the surveying techniques.	6	8

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Program: B.Tech. Civil Engineering					
Semester-V		BCEXX07: Introduction to Art and Aesthetics (Open Elective-I)			
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15Marks
Tutorial				CT-II	15 Marks
Total Credits	3			CA	10 Marks
Duration of ESE: 3Hrs				ESE	60 Marks
Pre-Requisites:				Total Marks	100 Marks
Course Contents					
Unit I	Art and Architecture: Romano-Indian Art in North-west India and Central Asia; Buddhist Art, Art of Kashmir, The Golden Age of Art: The Later Andhra Period, The Gupta Period, Late Buddhist Art in India, Nepal, Tibet.				
Unit II	Building Byelaws: Necessity of bye-laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), concept of V.P.R. Marginal distances, building line, control line, height regulations, room sizes, Area calculations (built-up area, carpet area etc.), Rules for ventilation, lighting, Vertical circulation, Sanitation and Parking of vehicles. Minimum Standard Dimensions.				
Unit III	Introduction to Architectural drawing: Principles of Building Planning and Principles of Architectural design relation between form and function, utility, aesthetics, Concept of Line plan, Developed Plan, Elevation, Section, Selection of scales for various drawings, dimensioning, abbreviations and symbols as per IS 962, Elements of perspective drawings, parallel and angular perspective of small building elements.				
Unit IV	Town Planning and legal aspects: Necessity of town planning. Development plan and its importance, Land use zoning, N.A. Sanction procedure, Introduction to different zones of land in town planning, Aspects of zoning. 7/12 abstract, meaning of different terms of 7/12 abstract, List of documents to be submitted to local authority. Introduction to RERA act. Introduction to Maharashtra Regional and Town Planning (MRTP) Act Safety aspects and services – Fire load, grading of occupancies by fire loads, Evacuation Time, fire escape elements, Need for earthquake resistant structures.				
Unit V	Green Building – Salient features, benefits, planning concepts of Green Building (site selection, orientation, sun path and wind diagram, etc.), introduction to Leadership in Energy and Environmental Design (LEED)				
Text Books					
T.1	The Pelican History of Arts, The Art and Architecture of India Buddhist/Hindu/Jain, Benjamin Rowland, Penguin Books				
T.2	Building Construction by B.C. Punmia, Laxmi Publications				
T.3	Building Materials by S.V.Deodhar, Khanna Publication.				
T.4	Building Construction by Bindra and Arora, DhanpatRai Publications.				

T.5	Building Drawings with an integrated Approach to Built-Environment by M. G. Shah, C. M. Kale and S. Y. Patki, New Delhi, Tata McGraw Hill. (5th edition.)
Reference Books	
R.1	Building Materials by S. K. Duggal, New Age International Publishers.
R.2	Building Construction by S.C. Rangwala, Charotdar Publications
R.3	Building Materials Technology by Ruth T. Brantley & L. Reed Brantley, Tata McGraw Hill. 5. National Building Code (latest).
R.4	Building Design and construction by Frederick Merrit, Tata McGraw Hill
R.5	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.
R.6	Development plan and DCP Rules of urban local body, New Delhi, Volume 12.
Useful Links	
1	https://nptel.ac.in/courses/124107011
2	https://nptel.ac.in/courses/124107161
3	https://nptel.ac.in/courses/124105001
4	https://nptel.ac.in/courses/124106009
5	https://nptel.ac.in/courses/128106005

	Course Outcomes	CL	Class Sessions
BCEXX07.1	Summarize the Art and Architectural concepts	3	9
BCEXX07.2	Use of Building byelaws for building construction.	3	8
BCEXX07.3	Use of Architectural Principles for building construction.	3	9
BCEXX07.4	Interpret Town Planning principles along with Safety and Legal aspects	3	10
BCEXX07.5	Plan concepts of green building considering LEED certification criteria	5	9

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